CHBE 545
Principles of Biomolecular Engineering, Design and Selection Spring 2021

Contact Information

Instructor: Dr. Ross Thyer
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Office Hours: By appointment

Course Website

CANVAS (http://canvas.rice.edu/)

Course Objectives and Learning Outcomes

Interfacing with biological systems and customizing their function depends on our ability to engineer their effector molecules; proteins and nucleic acids. This course will cover the tools available for biomolecular engineering, their application, and design considerations to avoid common pitfalls. By the conclusion of the course, students are expected to be able to:

- Understand which properties of biomolecules are amenable to engineering and why are some present unique challenges
- Compare and contrast different techniques for biomolecular engineering
- Understand the difference and trade-offs between screening and selecting
- Explain the concept of counter-selection and design a counter-selection circuit
- Explain the concept of stringency and discuss options for controlling it
- Identify possible failure modes and suggest appropriate controls or design changes
- Critically analyze data and conclusions from the primary sources
- Formulate an original research plan for a specific biomolecular engineering campaign related to their field of study

Prerequisites

Pre-requisite or co-requisite: None, however basic knowledge of molecular biology and/or related disciplines is expected.

Required Texts and Materials

Required:

• Class notes and primary literature distributed during the semester (posted on *Canvas*)

Recommended Reading:

• Packer, M., Liu, D. Methods for the directed evolution of proteins. *Nat Rev Genet* 16, 379–394 (2015). https://doi.org/10.1038/nrg3927

Exams and Papers

Mid-term Assignment
Final Assignment

Grade Policies

Letter Graded:
40% Presentations in the weekly discussion sessions
20% Mid-term Assignment
40% Final Assignment

Absence Policies

Although class materials (slides and primary literature) will be mostly posted on the class website, attending class will be necessary to properly analyze and develop an understanding of them. Students are required to attend all the lectures on 545 and all the literature presentation/discussion sessions on 545. Students who are absent without prior notification to the instructor may not receive points for the corresponding section.

Rice Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

Disability Resource Center

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with the Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Syllabus Change Policy

This syllabus is only a guide for the course and is subject to change with advanced notice.

Course Schedule

Wednesday/Friday 2:45pm - 4:05pm